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RAILROAD RIGHT-OF-WAY VEHICLE INCURSION PREVENTION RESEARCH

SUMMARY

The Federal Railroad Administration's (FRA) Office of Research, Development and Technology (RD&T) sponsored research conducted by the John A. Volpe National Transportation Systems Center (Volpe Center), to evaluate the effectiveness of engineering treatments to deter vehicles from turning onto the rail right-of-way (ROW) at highway-rail grade crossings. The goal of the treatments is to reduce the number of vehicles that mistakenly enter the ROW, thus reducing the possibility of an incident with a train.

The Volpe Center partnered with SunRail (the commuter rail system in the Orlando area) and the City of Orlando, FL, to develop vehicle ROW incursion prevention engineering treatments, identify suitable grade crossings for implementation, collect before and after data, and evaluate the results.

Treatments were installed at two crossings in the City of Orlando, FL, and evaluated through December 2016 to December 2017 after installation. The locations selected for this study were the grade crossings at W. Washington St. (Crossing ID 622188X) and W. Jefferson St. (Crossing ID 622187R) within the city. Volpe research staff developed the treatments for the two crossings. Vehicle ROW incursion data before and after the installation of the treatments was collected by SunRail and analyzed by the Volpe research staff. The ROW incursion treatments, as shown in Figure 1 for the W. Washington St. crossing, were installed on December 19–20, 2016.

Results indicate that those treatments had a positive effect on reducing ROW incursions by motor vehicles. Incursions decreased significantly at both crossings, down 75 percent at the W. Washington St. crossing and 67 percent at the W. Jefferson St. crossing over the 2-year evaluation period.

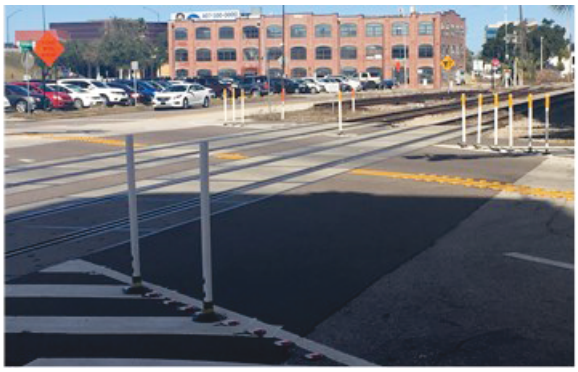

Figure 1. ROW Incursion Treatments Installed at the W. Washington St. Crossing in Orlando, FL

BACKGROUND

Vehicles turning onto the railroad ROW are a significant problem. There have been several high-profile incidents involving vehicles mistakenly turning into the railroad ROW at grade crossings. One of these recent incidents occurred in Oxnard, CA, on February 14, 2015. The incident involved a pickup pulling a trailer that turned onto the ROW and was struck by a Metrolink train resulting in 27 injuries, 1 fatality and 3 overturned passenger rail cars. The incident occurred when the driver "entered the railroad right-of-way and turned onto the track instead of turning right onto E. 5th Street, located beyond the grade crossing" [1].

In response to these types of incidents, FRA initiated research on engineering solutions to address this problem in 2015.

OBJECTIVES

The main objective of this research was to study potential engineering treatments to prevent rail ROW incursions by vehicles and provide FRA and stakeholders with safety benefit information.

METHODS

The Volpe Center partnered with SunRail to develop, install, and evaluate promising vehicle ROW incursion prevention engineering treatments. Two sets of treatments were developed and evaluated at crossings in the City of Orlando, FL. Researchers collected baseline data on the two selected crossings over a period of 12 months before the treatments' installation, and another 12 months after. The research team then compared the incident data between the two periods.

RESULTS

The following paragraphs provide a discussion of the results obtained during this study.

Location

The locations selected for this study were the grade crossings at W. Washington St. (Crossing ID 622188X) and W. Jefferson St. (Crossing ID 622187R) in the City of Orlando, FL. The crossings, shown in Figure 2, are about 300 feet apart on the SunRail line. Both roadways carry two-way vehicular traffic over the crossings, which are both equipped with flashing lights and gates. According to the DOT Crossing Inventory data, the estimated Annual Average Daily Traffic at these crossings was 4,700 for W. Washington St. and 4,820 for W. Jefferson St. in 2008 with a posted speed limit of 35 miles per hour (mph) on W. Washington St. and 25 mph on W. Jefferson St. [2]. The crossings are on the SunRail commuter rail line and are traversed by both passenger (SunRail and Amtrak) and freight (CSX) trains at speeds ranging from 20 to 25 mph. An average of 41 trains pass though the crossings daily on weekdays and 8 trains pass through the crossings daily on weekends.

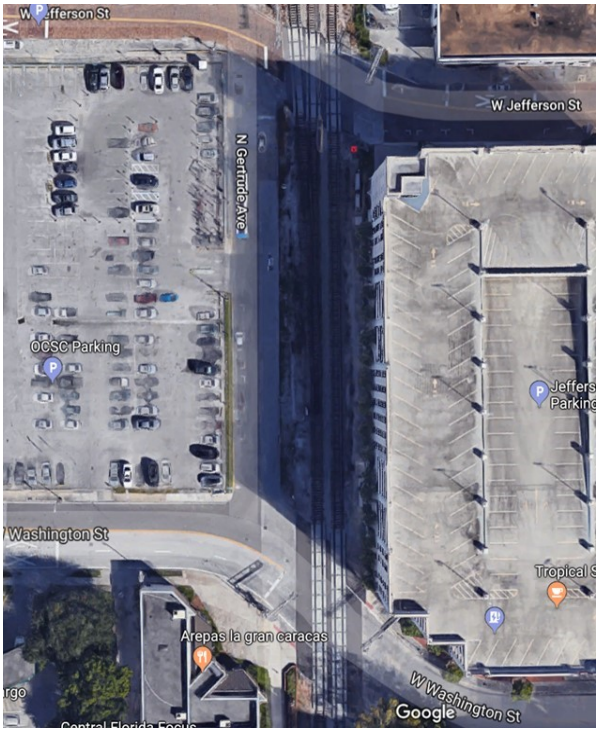

Figure 2. Location of Grade Crossings

These crossings were selected due to their high ROW incursion incident rate relative to the rest of the crossings on the SunRail system. According to FRA's safety data, two vehicle/train incidents have occurred at the W. Washington St. crossing and four have occurred at the W. Jefferson St. crossing since 2000 [2]. According to SunRail records, a total of 11 ROW incursions not resulting in collisions with trains (where the vehicle was removed before trail arrival) were reported at these two crossings in 2016 alone.

The location of N. Gertrude Ave., which runs parallel to the tracks and connects to both streets next to the crossings, may be a significant factor. Its proximity to the crossings may lead drivers on W. Washington St. or W. Jefferson St. to mistake the ROW for N. Gertrude Ave. especially during nighttime hours. All ROW incursion incidents over the past 2 years at these crossings occurred at nighttime, where lighting conditions are minimal in this area.

Design (treatments)
The research team developed a set of potential engineering treatments for preventing vehicle incursions into the rail ROW. Of those, a set of low-cost treatments were selected for evaluation. These were:

1. Extension of white edge pavement markings through the crossing
2. Extension of yellow centerline pavement markings through the crossing
3. Addition of reflective markers on the pavement markings through the crossing
4. Addition of flexible delineators on both sides and in-between the tracks

The W. Jefferson St. crossing was equipped with the first two treatments (pavement markings only) and the W. Washington St. crossing was equipped with all four treatments. This was done to determine if the addition of reflective markers and delineators provided added safety. The treatments installed at the W. Washington St. crossing were shown previously in Figure 1. Figure 3 shows the pavement marking treatments installed at the W. Jefferson St. crossing.

Figure 3. ROW Incursion Treatments Installed at the W. Jefferson St. Crossing

Data Collection and Analysis
The data collection task consisted of collecting reports of incidents of vehicles on tracks from SunRail. These were incidents of vehicles stuck on the tracks regardless of whether or not they were struck by a train.

Pre-Installation: A total of twelve months of data was analyzed for both crossings in the pre-installation period from 12/19/15 to 12/18/16. A total of four ROW incursion incidents were reported at the W. Washington St. crossing and six ROW incursion incidents were reported at the W. Jefferson St. crossing. All incidents occurred during nighttime hours between 9:30 PM and 3:00 AM.

Post-Installation: The treatments were installed on December 19–20, 2016. A total of 12 months of data was analyzed for both crossings in the post-installation period from 12/21/16 to 12/20/17. A total of one ROW incursion incident was reported at the W. Washington St. crossing and two ROW incursion incidents were reported at the W. Jefferson St. crossing. All incidents occurred during nighttime hours between 12:00 AM and 3:00 AM.

Comparative Analysis: As shown in Figure 4, vehicle ROW incursions decreased significantly at both crossings between the two periods. They went down 75 percent at the W. Washington St. crossing (from 4 to 1) and 67 percent at the W. Jefferson St. crossing (from 6 to 2). It appears that the addition of the reflective markers and flexible delineators, although significantly increasing the overall cost, provided an additional safety benefit over the pavement markings.

Due to the very small sample size, a statistical analysis of the results is not appropriate. The results should therefore be interpreted with caution.

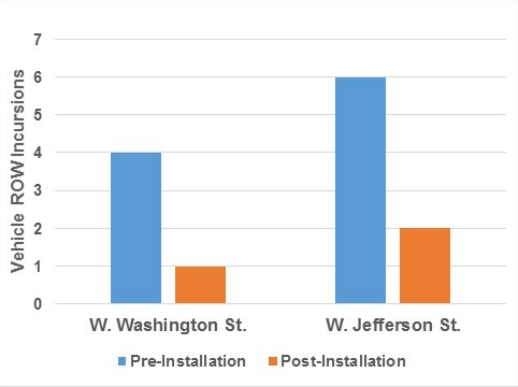

Figure 4. Number of ROW Incursions Before and After the Installation of the Improvements

CONCLUSIONS

The project successfully demonstrated the use of low-cost engineering treatments to lower the frequency of ROW incursions by vehicles at grade crossings. Results of the engineering treatments tested during this study indicated a positive safety benefit from these improvements.

FUTURE ACTION

FRA is continuing research in this area, with the intention of disseminating the results to rail safety stakeholders. Recommendations on the use of these types of safety treatments need to be further developed and encouraged at crossing locations where vehicle incursions are known to be a significant issue.

REFERENCES

[1] National Transportation Safety Board. 19 March 2015. Prelimary Report HWY15MH006. Available: https://www.ntsb.gov/investigations/AccidentReports/Reports/HWY15MH006_preliminary.pdf.

[2] Federal Railroad Administration Office of Safety Analysis. 27 August 2018. Available: https://safetydata.fra.dot.gov/OfficeofSafety/default.aspx.

ACKNOWLEDGEMENTS

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KEYWORDS

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